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ONTARIO

FISH AND WILDLIFE

REVIEW

Volume Seven, Numbers Three and Four

Fall–Winter, 1968

ONTARIO

DEPARTMENT OF LANDS AND FORESTS

HON. RENE BRUNELLE, MINISTER

G.H.U. BAYLY, DEPUTY MINISTER

ONTARIO
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CONTENTS PAGE

Aerial Census Data to Manage a Moose Herd 3
by C.H. Olver

The Lake Nipigon Commercial Fishery 11
by B.H. Gibson

The Capability of the Land to Produce Wildlife 17
by R.D. Thomasson

New Gear for the Patricia Fisheries 25
by G. Lindsay Penney

THE COVER

"Friends now that the rutting season has passed," notes D.W. Simkin in explaining his cover shot of three young bull moose on a frozen lake. On the back cover, he offers another aerial view: two moose spied by census takers in a fairly old, mixed forest in mid–winter. Further photos and all the details in C.H. Olver's story on Page 3.

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EDITORIAL

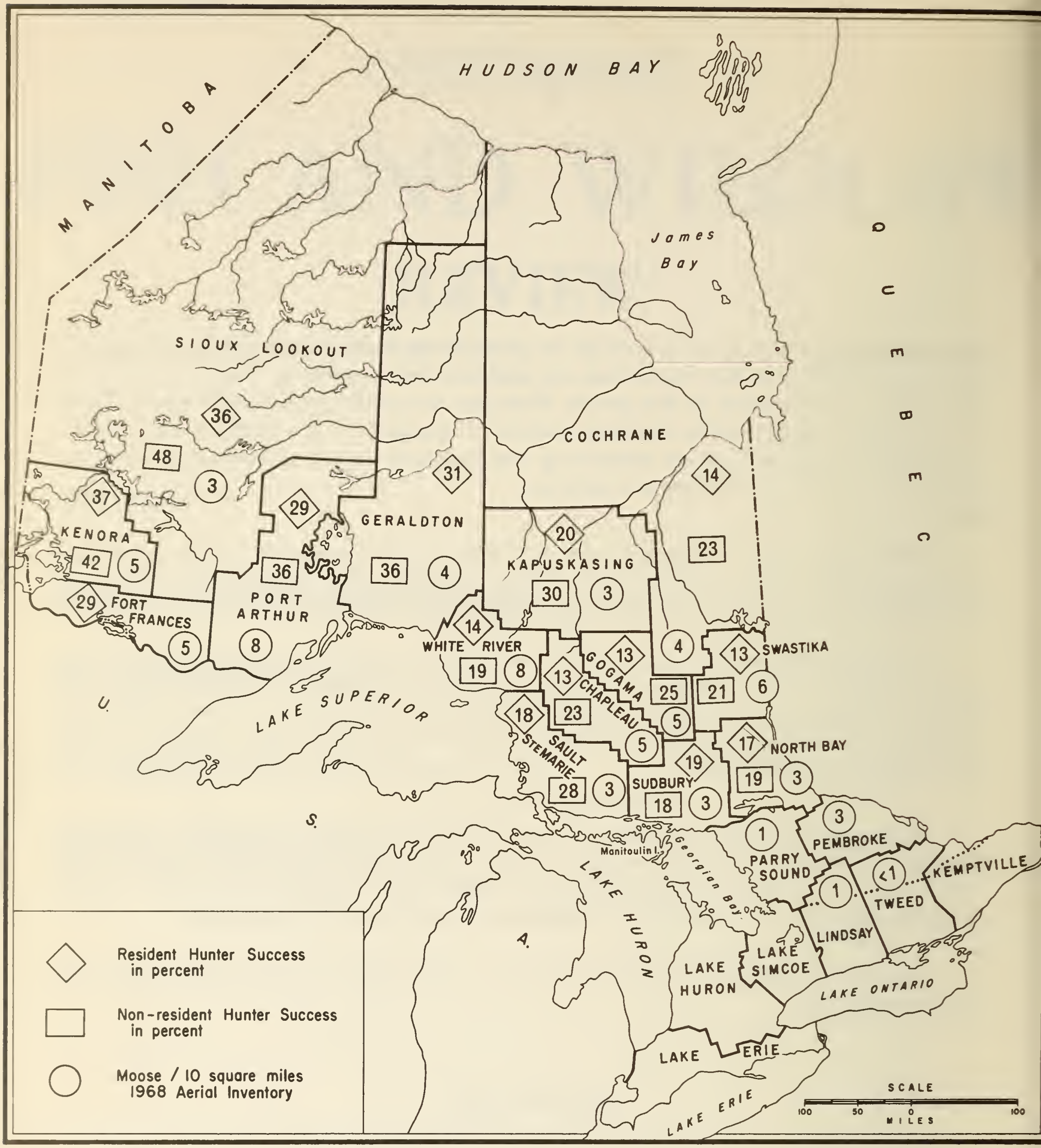
Sound biological principles should be the prime basis for fish and wildlife management programs. Building on this foundation, we need detailed information about our resources now, and their potential for the guture. When you encounter Department staff sampling fish, tagging moose, radio–tracking wolves or engaged in a myriad of other data–collecting activities, you are witnessing the accumulation of information which forms the framework of our management policies.

Renewable, natural resources are exhaustible if not managed properly, and one need not look far for examples of this fact. However, just as man finds fault more easily than he gives praise, examples of proper management are frequently overlooked.

In this issue, we have some prime examples of improved management programs which resulted from biological investigation. Trout-stocking in Lake Nipigon was found to be futile; a change in size of net-mesh increased the income of Patricia Indians; and a moose census in the Sault Ste. Marie District brought a change in hunting seasons and boundaries.

Many data-collecting programs do not illustrate the need for drastic management changes since the population studied is shown to be maintaining itself under current conditions. It is only after investigations have been conducted and their results analyzed that the effectiveness of management programs can be evaluated.

Constant surveillance ensures that Ontario in the future will be as rich a province as we enjoy today.



MAP No. 1: HUNTER SUCCESS AND AERIAL INVENTORY RESULTS FOR ONTARIO, 1967-68

AERIAL CENSUS DATA TO MANAGE A MOOSE HEARD

by C.H.Olver
Biologist, Sault Ste. Marie Forest District
(Photos by D.W. Simkin)

The need for accurate estimates of Ontario's moose population was clearly demonstrated in 1949 and 1950 when a worried public, believing moose numbers to be too low,demanded and got a season closure. Methods of aerial census were developed in the mid '50's and further improved in the next few years. A sound aerial census of the provincial moose population in the winters of 1958–59 and 1959–60 resulted in the acceptance of the aerial census data as the fundamental requirement for establishing a management program.

During January and February, 1967, a moose inventory was conducted to determine the number and distribution of moose in Sault Ste. Marie Forest District. The last census in this area occurred during the provincial survey in the winter of 1958–59, and a resurvey was deemed advisable because an increasing number of hunters and tourist outfitters felt that the moose population had decreased in recent years, particularly in the more accessible parts of the District. Furthermore, the moose seasons were to be reviewed prior to 1968.

Two moose seasons of different length occurred within the District. Moose hunting in the northern portion (Schedule 9) lasted from October 1 to January 8, and moose hunting in the southern part (Schedule 10) was allowed from November 7 to November 30.

The District was divided into two strata coinciding with these Schedules, and the number of plots selected in each stratum was proportional to its area.

The survey is conducted by flying in very tight circles over the plots in a fixed-wing aircraft, thus enabling observers to see virtually the entire ground area, even that under moderately dense stands of conifer. This technique was developed in Gogama Forest District several years ago and is often referred to as the "Gogama method". In other parts of the North American moose range where the technique has been applied, it is called the intensive search, or orbiting method.

The aerial survey crew was comprised of a pilot, a navigator and two rear-seat observers. Observers counted moose and noted moose tracks while the navigator ensured that observations recorded were within the boundaries of the plot. As moose were observed, he plotted them as exactly as possible on a large-scale map.

A total of 49 plots, 28 in the northern stratum and 21 in the southern, was randomly selected for analysis. Thus, the total area on which counts were made was 49 x 25 = 1,225 square miles. This was 15.2 per cent of the entire area of the District.

On the 49 plots, 302 moose were counted. Plot counts varied from a high of 21 moose to a low of zero. Figure 1 shows the approximate location of plots and the number of moose seen on each.

After the survey was completed, it became clear that much variation existed in moose population densities throughout the District. To achieve a better understanding of the moose distribution within the more accessible part (Schedule 10),

TABLE 1. MOOSE DENSITIES AND POPULATION ESTIMATES, SAULT STE. MARIE DISTRICT, WINTER 1966–67.

		Schedule 9			Schedule 10		
	District	Schedule 9 Total	Other than L. Superior Prov. Park	L. Superior Prov. Park	Schedule 10 Total	Transition Zone	Low Moose Zone
Area – square miles	8,266	4,803	4,283	520	3,463	1,819	1,644
– per cent of total	100.0	58.1	51.8	6.3	41.9	22.0	19.9
No. Moose per 10 sq. mi.							
– average	3.2	4.5	4.6	3.2	1.7	2.5	0.3
– lower limit	2.4	3.3	3.4	0.0	0.7	1.1	0.0
– upper limit	4.1	5.6	5.8	7.6	2.6	3.9	0.7
Population Estimates							
– average	2,630	2,142	1,970	166	548	453	59
– lower limit	1,952	1,595	1,448	0.0	238	204	3
– upper limit	3,307	2,685	2,403	397	855	704	112

Moose on the move. Running moose are spotted easily by aerial survey crews.

it was divided into two zones, a Low Moose Zone and a Transition Zone. This division was predicted on the basis of the density of moose observed on plots.

Nil counts occurred on five of the eight plots in the Low Moose Zone and on only two of the 13 plots in the Transition Zone. There were no zero counts in the 28 plots flown in the Schedule 9 hunting area. The number and frequency of nil counts, in relation to the total number of plots surveyed in each area, undoubtedly were related to the relative densities of moose in the three designated areas, i.e., the more moose in a given large area, the more chance of moose being in randomly selected plots in the area.

Population estimates and moose densities, which were derived from the number of moose observed on each plot, are presented in Table 1. The moose population for the entire District was estimated to be 2,630. Eighty per cent of the moose (2,142) occurred un the northern stratum which occupies 58 per cent of the District area. The southern stratum, which contained the remaining 42 per cent of the land area, had only 20 per cent of the moose population (548). Within the southern hunting area, the Transition Zone (22 per cent of the District area) had 15 per cent of the moose population (453) and the Low Moose Zone (20 per cent of the District area had slightly less than five per cent of the total district moose population (Figure 2).

The usual way of expressing the results is in terms of moose per 10 square miles. The moose density for the entire District was 3.3 moose per 10 square miles. The moose density for the northern area (4.5) was greater than the District average and considerably greater than that of the southern area (1.7). The two sub-divisions of the southern area, the Transition Zone and the Low Moose Zone, had population densities of 2.5 and 0.4 moose per 10 square miles, respectively. The moose density for Lake Superior Provincial Park (3.2),

TABLE 2. Calculated Kill, Hunter Success, Hunting Pressure, and Exploitation Rate of Moose in the Sault Ste. Marie District, Fall 1966.

	Calculated Kill (numbers)	Hunter Success (per cent)	Hunting Pressure (total estimated man-days)	Exploitation Rate (per cent)
Schedule 9				
Residents	308	12.6	18,605	12.6
Non-Residents	181	35.5	3,932	7.8
Total	489		22,537	18.6
Percentage of Grand Total	72.3		84.2	
Schedule 10				
Residents	162	21.7	3,999	22.8
Non-Residents	21	54.1	237	3.5
Total	183		4,236	25.0
Percentage of Grand Total	27.7		15.8	
Combined Data				
Residents	470	14.9	22,604	15.2
Non-Residents	202	34.5	4,169	7.1
Grand Total	672		26,773	20.4
Average		17.9		
Lake Superior Provincial Park	50			23.1

FIGURE I. NUMBER OF MOOSE SEEN PER PLOT, WINTER 1967

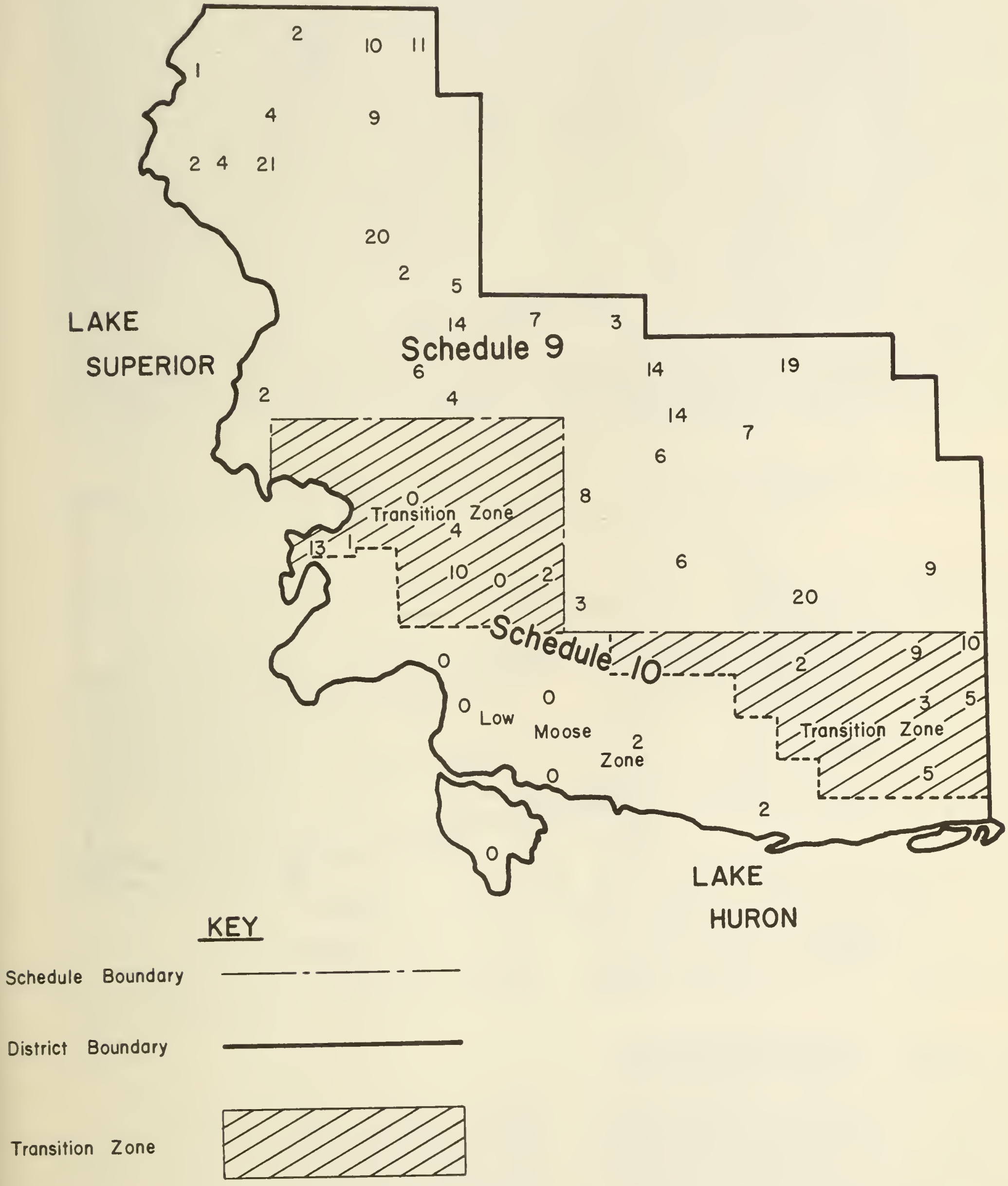
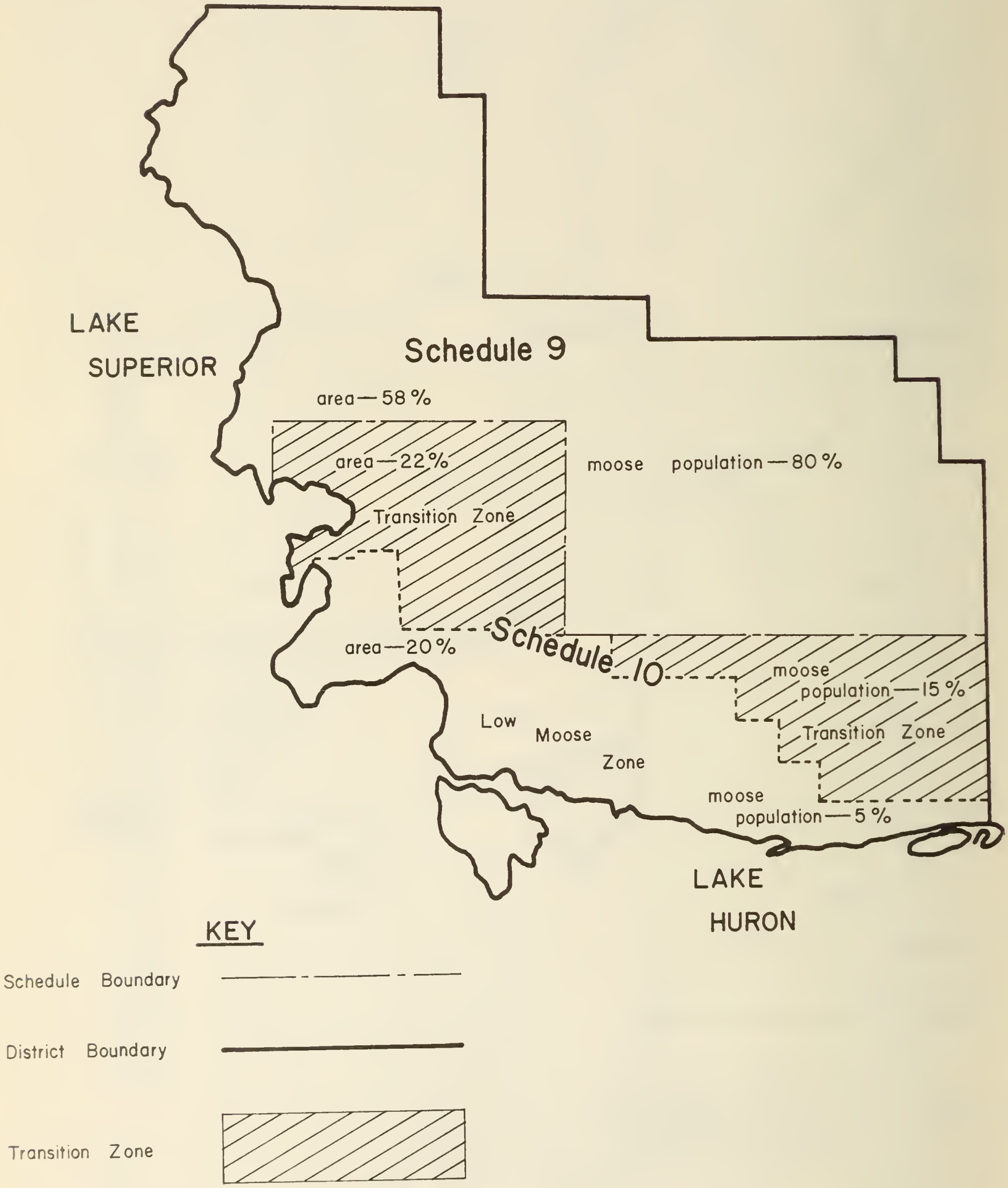


FIGURE 2. DISTRICT MOOSE DISTRIBUTION, WINTER 1967



Five bull moose on the edge of a frozen lake. Two have shed their antlers while one has only one left. Only the smaller animals have both their antlers.

which was part of the northern zone, approximated the District average.

Staff, familiar with moose and moose hunting in the Low Moose Zone, attibute the low density to a combination of three different factors. First, the area is characterized by a very large number of access roads; these render the moose more available to hunters and result in increased efficiency in harvesting. Second, there are many illegal kills made by holders of deer licences in the mid-November two-week deer season. Third, the area is comprised of generally inferior moose range characterized by semi-agricultural areas.

The data of Table 2 affords a ready comparison of the harvest, hunting success, hunting pressure, and exploitation rates of moose in the two hunting regions (Schedules 9 and 10) which existed in 1966. These data indicated that a difference in kill and exploitation rate existed in relation to the 1967 distribution of the District moose population. The harvest in the northern area (72.3% of the District total) was taken from an area which supported 80 per cent of the District populations, while in the southern area the harvest (27.7 per cent of the District total) was taken from an area which supported only 20 per cent of the District population.

The distribution of hunting pressure was considered as satisfactory because, in relation to moose numbers, it was greater in the northern area than in the southern.

The exploitation rate of 25 per cent in the southern area was believed to be approaching the maximum allowable and, while it may have been possible to maintain this rate, it was deemed undesirable to allow it to increase. In the northern area, the exploitation rate of 18.6 per cent could be increased considerably without reducing the reproduc-

Moose cow and calf, obviously not too disturbed by aerial survey plane.

tive stock necessary to maintain the population.

In order to correct the present imbalance of kill and exploitation in relation to the present moose distribution, a change of seasons and season boundaries was recommended.

One such recommendation was to advance the hunting season from the 1967 dates (November 7 to November 30) to the month of October. This change would reduce the effectiveness of hunters who used snow machines for penetration into what was already the most highly accessible part of the district. Also, this would eliminate overlapping moose and deer seasons and should reduce the illegal moose kills by holders of deer licences.

The second course of action proposed was a change in the boundary between Schedule 9 and Schedule 10. It was recommended that the boundary (Figure 2) should be moved considerably north and east of its present location. The northern advancement of the boundary was required to provide greater protection to moose populations located in readily accessible areas on both sides of the Schedule 9–10 border. Lake Superior Provincial Park was included in the short moose season (Schedule 10) because it was felt that any substatial increase in the exploitation rate (calculated to be 23.1) of moose from this area would be undesirable.

Both of these recommendations were accepted and incorporated in the 1968 hunting regulations.

As a result of this extensive moose survey conducted in Sault Ste. Marie Forest District, adequate data were provided to allow for a satisfactory harvest in accord with the principle of maximum sustained yield. Additional surveys will be undertaken every few years so that the appropriate action can be taken to maintain the moose population and the harvest at the highest possible level.

THE LAKE NIPIGON COMMERCIAL FISHERY

by B.H. Gibson
Biologist, Geraldton Forest District

The Lake Nipigon commercial fishery is conducted on the largest inland lake in Ontario. Nearly 1,800 square miles in area, of which 1,530 square miles are water surface, the lake is quadrangular in form, about 55 miles long and 40 miles wide. It is very irregular in outline, with numerous bays of various sizes making a shoreline length of more than 580 miles. The surrounding land is rugged and hilly with some bluffs extending up to 600 feet above lake level.

Much of Lake Nipigon is deep, with only a limited amount of shallow water. Depths of 200 to 300 feet are common;the maximum known depth is 402 feet, and the estimated average depth is 70 feet. These characteristics of Lake Nipigon make it well suited to deep–water fish fauna such as lake trout and lake whitefish.

These species and walleye are the chief commercial fish. Lake trout and lake whitefish are caught over most of the lake, while the walleye fishery is confined mainly to the shallower bays, such as Ombabika Bay on the north–east side and North Bay at the north end.

Lake Nipigon was opened to commercial fishing in 1918 to provide the people of Ontario with cheap protein, which was needed because of shortages caused by war demands.In that first year, more than 2,000,000 pounds of fish were taken by commercial fishermen from Lake Nipigon. Whitefish accounted for more than half the total, and lake trout nearly 600.000 pounds.

Lake Nipigon still has a significant commercial fishery, with 22 licences on the lake (three owned by Indians, two of which are band licences) providing full or part–time employment during the ice–free period for approximately 75 fishermen.

Despite the fact that there has been continuous decline in the total catch since 1918, the value of the landed fish has fluctuated. In 1918, more than 2,000, 000 pounds of fish had a value of $129, 000, while an average catch of 714,792 pounds over the last five years was worth $141,690.

The fishery is the main source of livelihood for settlements bordering the lake. The larger of these are Macdiarmid, on the south–east end, and Gull Bay on the west side.Fish are shipped from these centres by road and rail to Montreal, New York,Chicago and other large cities.

Most of the progressive fishermen on Lake Nipigon have steel tugs powered by diesel engines. Gill nets are the main type of gear used around the islands and in open water for lake trout and whitefish. Echo sounders are used by some fishermen to assist in locating suitable waters for netting. Mechanical net lifters are installed on many boats to facilitate the lifting of nets.

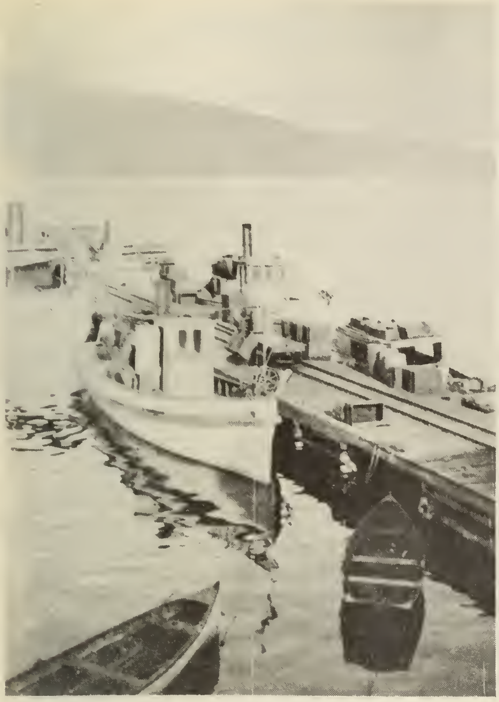
Although gill nets have been used in the walleye fishery since the beginning there has been a modest shift over the years to trap nets, mainly in Ombabika Bay. Trap nets can be set effectively here because this bay is shallow. Unfortunately, because of the large amounts of silt carried in by a water diversion, the walleye fishery appears to have suffered. Most of Lake Nipigon, however, is too deep and too exposed to strong winds for effective trap net use. Also, the purchase price (over $1,000

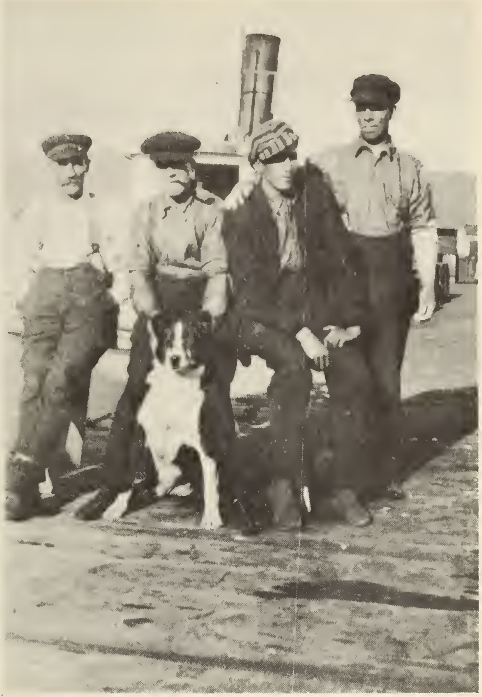
Macdiarmid, one of the settlements bordering Lake Nipigon where commercial fishing is the main source of livelihood. Photo by L.A. Townes.

each) tends to discourage their use. Nevertheless, the advantages of trap nets over gill nets are clear: the fish are alive when the net is lifted, insuring a fresher and better-quality product of high market value; and undersized fish can be returned unharmed to the water. (Small fish caught in gill nets are often injured and die when released).

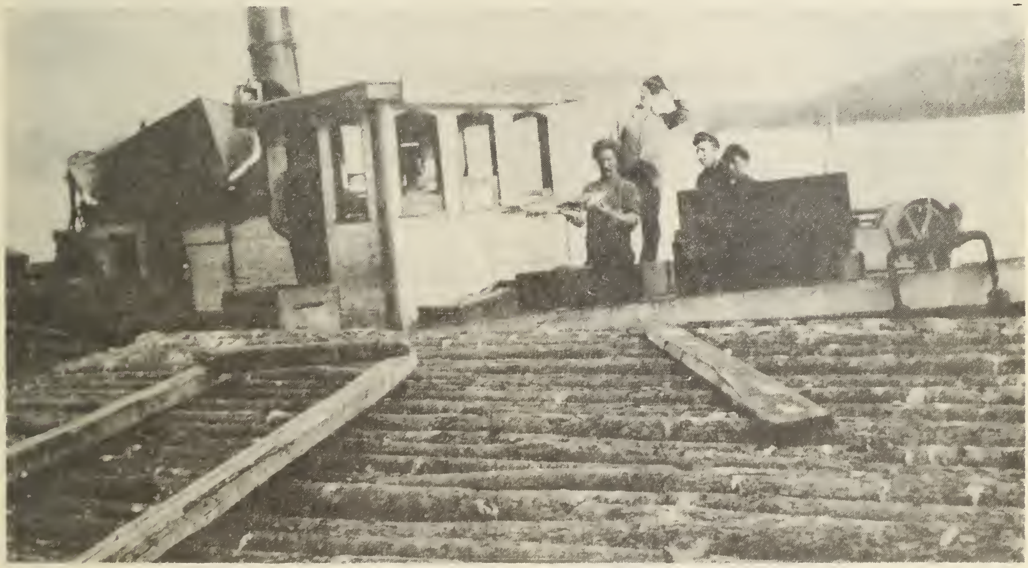
Studies of walleye have been directed primarily towards tagging programs and growth-rate studies. These studies are still in the early stages and have not yet produced results worthy of discussion at this time.

Whitefish is the most important species taken by commercial fishermen in Lake Nipigon, although tremendous fluctuations in the whitefish catch have occurred. In 1957, 197,000 pounds were taken; yet only four years later, in 1961, 650,000 pounds were landed. This fluctuation is possibly related to the fishing effort which is often related to the price of fish. (Year-class strength has been found to be a major factor in annual





Macdiarmid, 1917. Steam tugs "Jenet B" and "Ombabika" on the near side of the Government dock, across from the tugs, "Pewabic" and "Viking", and the gasboat, "Rambler", furthest away. On the right, engineers of the tugs, "Sea Gull", "Ombabika" and "Pewabic", pose in front of the "Sea Gull". Photos by Adolph King.



Macdiarmid, 1918. Piled high with full fish boxes, the tug "Pewabic" is docked to unload. Photo by Adolph King.

Mechanical net lifter on the boat of Mr. A. Sutherland. Photo by L.A. Townes.

Ray Hardy, commercial fishermen, with the 54–pound lake trout he took from Lake Nipigon on March 22, 1967. The 16–year–old trout had a girth of 32 inches and a length of 46.25 inches. Photo by K.G.Horton.

fluctuations in other whitefish fisheries.)

A three–year lake trout study, completed in 1962, involved the sampling of trout caught by commercial fishermen to determine growth rates, food habits and fishing pressure.

It was found that the growth rate of the lake trout of Lake Nipigon is considerably higher than the provincial average. An eight–year–old lake trout in Lake Nipigon averages 6.3 pounds in weight and 25 inches in length compared to the provincial average of 4.2 pounds and 22 inches.

This above–average growth rate can be attributed to several factors.

Macdiarmid, circa 1950. The fishing fleet. Photo by L.A. Townes.

Large areas of deep, cold water are available in the summer, and oxygen is plentiful at all times. The lake is blessed with a relatively high, chemical nutrient supply with an average, total dissolved solid content of 110 parts per million. The food supply is plentiful since there are abundant forage fish, particularly ciscoes. The long history of commercial fishing also contributes to the impressive growth rate, since a harvest of fish means less competition for food and space among the remaining lake trout.

This study indicated the futility of stocking hatchery-reared lake trout in Lake Nipigon to help maintain the commercial fishery. Between 1951 and 1956, a total of 173,000 fingerling and yearling trout were stocked. In the three-year study, in which 1,536 lake trout were examined, only 16 (approximately one per cent) of the fin-clipped stocked

Macdiarmid, 1968. Winter scene. Photo by L.A. Townes.

fish were recovered by commercial fishermen. It appears thatconditions for natural reproduction and survival of lake trout are entirely adequate to maintain the population. Continued stocking of lake trout is not considered necessary, and has been discontinued.

Fortunately, the sea lamprey and smelt have not shown up in Lake Nipigon, since sufficient barriers exist to prevent their migration from Lake Superior. The danger exists that anglers may unintentionaly introduce these species. The presence of lampreys would deplete the lake trout population, while results from other lakes indicate that a smelt introduction would be harmful.

A Lake Nipigon Fisheries Management Unit was extablished this year. This unit is conducting a detailed study of the lake (including chemical, physical and biological parameters) to assess its capability to produce and support fish. An immediate project of the new unit will be the echo sounding of Lake Nipigon to produce a contour map, a major undertaking on a lake of this size.

As data accumulate, a plan will be developed for the management of Lake Nipigon's commercial and sport fisheries. Because the plan will be based on sound biological information, we are optimistic that Lake Nipigon will continue to sustain one of the most important fisheries in Ontario

THE CAPABILITY OF THE LAND TO PRODUCE WILDLIFE

by R.D. Thomasson
Biologist, Fish and Wildlife Branch
(Photos by the Author)

The Canada Land Inventory is compiling maps showing the capability of the land to produce agricultural crops, timber, fish and wildlife and to provide for recreation. The inventory was established by ARDA, the Agricultural and Rural Development Act, enacted under a slightly different name on June 22, 1961.

In Ontario, the capability of designated areas to produce deer and moose is being rated by Fish and Wildlife Branch. In these areas (Figure 1), the ARDA inventory has been expanded to include beaver, European hare, sharp–tailed ruffed grouse, Hungarian partridges, ring–necked pheasants, puddle ducks (mallard, black, teal, etc.), wood ducks and diving ducks. It also rates land areas on their capability to produce duck hunting and attract migrant geese.

Most of southern Ontario has already been rated for wildlife production (Figure 2), and the project is expected to be completed by March 31, 1970-

In the Ontario portion of the ARDA inventory, the basic division of land is the "land unit". One or more land units form a planning division, called a "landscape unit". The system of land units and landscape units was developed by the Site Unit of the Forestry Section of Research Branch[1] which has been producting land unit maps of most of Ontario for a number of years.

A land unit has an area of at least four square miles; it has homogeneous land characteristics or a pattern of land components which repeats itself throughout the unit. For example, one unit may be a flat, clay plain with a minimum of land variation, while another may be composed of rolling land with dry hill–tops, fresh slopes and wet pockets of organic soil.

All ratings are made on the assumption that the land will be managed for a specified species. Thus, ratings do not always indicate the present population or production level of the species.

Land units are divided into seven classes ranging from Class 1, the best, which is capable of producing large amounts of wildlife, to Class 7, the poorest, which can produce little or no wildlife even under intensive management.

A common example is the land which is rated Class 1 or Class 2 for deer. Much of this land is managed intensively for agriculture and does not produce large numbers of deer.

At the same time that the land is rated for its capability to produce wildlife, it is also rated under "Degree of Effort" in five classes, A to E. This rating indicates the relative amount of time and energy which must be expended if a land unit is to produce wildlife at its assessed capability. Unlike capability ratings, the initial degree-of-effort rating is subject to change and will require periodic revision.

In intensively farmed areas, the land is usually rated Class C for deer production. This means that the land would have to be reforested, and a period of from 10 to 15 years elapse before deer would be produced at the assessed

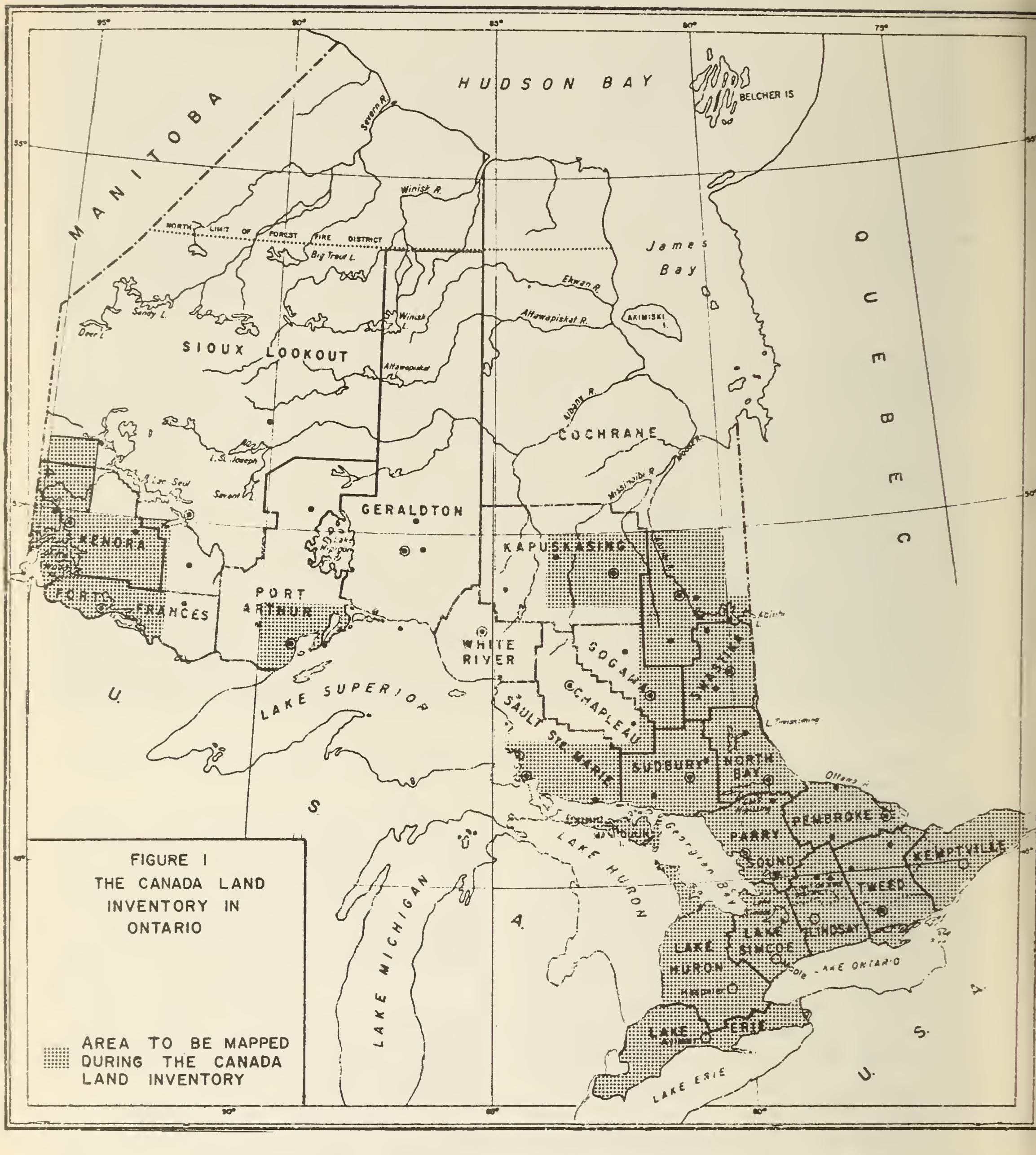


FIGURE I
THE CANADA LAND INVENTORY IN ONTARIO

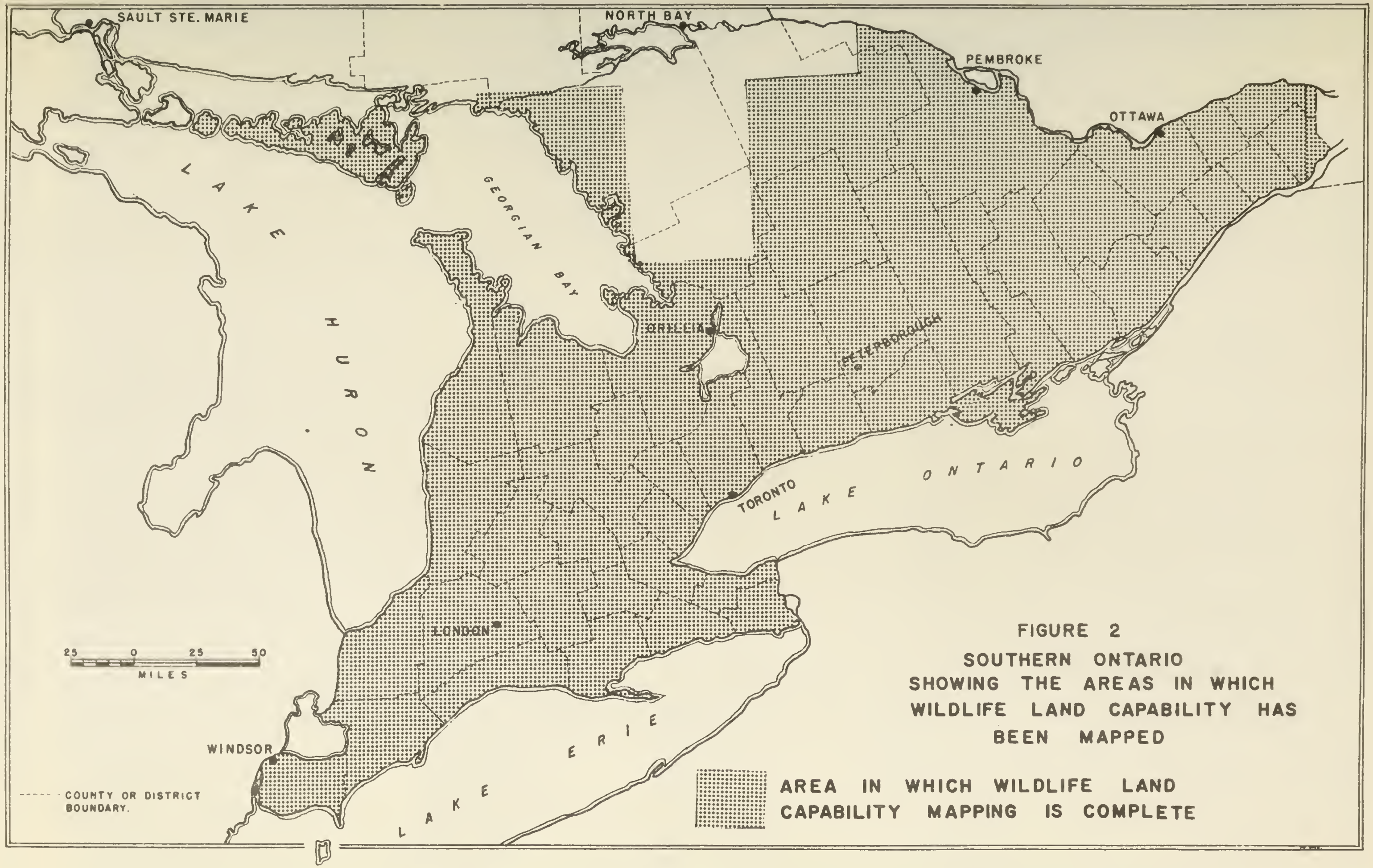


FIGURE 2
SOUTHERN ONTARIO
SHOWING THE AREAS IN WHICH
WILDLIFE LAND CAPABILITY HAS
BEEN MAPPED

Class 2 marshes produce a great amount, and large variety, of vegetation, providing food and cover for ducks.

Class 6 for duck production. Northern lakes are deep, produce few aquatic plants, and have little or no marsh fringe.

capability. The same farming areas would often be rated Class A for the production of Hungarian partridge because, for this species, agriculture provides good habitat.

In Ontario, land capability for production of at least one species of ungulates, upland small game, ducks, and migrant geese is rated for each land unit. Natural range and habitat requirements determine the species which can be rated. When the unit can produce a number of species of upland small game, two or three species are selected on the basis of hunter preference and the availability of each species in the general area. For example, if an area produces pheasants, Hungarian partridge and ruffed grouse, the land capability to produce the first two species will be rated, but the ruffed grouse may be ignored since they occupy a larger portion of Ontario.

To determine land capability, the field work is done by a party of university students, headed by a biologist, who first study aerial photographs and soil and topographical maps of the land unit to be rated. On the following day, they travel through the area by car or boat or on foot to make detailed observations on the pattern of land types, soil, topography, existing cover, present land use, and other ecological factors which

Class 2 lands produce large amounts of woody and herbaceous vegetation. Wildlife production is high.

Class 4. Areas of shallow soil over cracked, sedimentary limestone.

Class 3. Wildlife production on flat, poorly drained clay is limited by excessive moisture, low levels of plant nutrients, and poor soil structures.

Class 7 lands produce little or no wildlife.

bear on land – capability and initial degree-of-effort ratings. (In some areas, the observations are made from aircraft.) Tentative capability and initial degree-of-effort ratings are entered in the field party's notes.

Following the field report, the primary productivity class (the basic capability of the land to produce vegetation) is determined by reference to sets of tables[2]. This procedure enables the biologist to assess the land's capability to produce nutritious food, a variety of food, and a variety of cover, and the degree to which the land lends itself to management.

Once the primary productivity class is known, the limiting and compensating factors are assessed. A limiting factor is anything that reduces the capability of the land to produce wildlife below Class 1. In coarse sand, for example, a lack of fertility, or a lack of available moisture for plant growth, will affect all species of wildlife. Excessive rain in late June and early July is a limiting factor for Hungarian partridge but not for deer. Similarly, heavy snowfall downgrades some land units for ring-necked pheasant production.

A compensating factor is anything that increases the capability of the land to produce wildlife above the primary productivity class. If a sandy unit has a number of small pockets of alder scattered throughout, ruffed grouse production will be higher than on a similar unit which has no alder. In another instance, the ability of a unit to provide good wintering areas for deer may compensate for severe winter weather.

Finally, after a careful consideration of all the major, known ecological factors affecting a specified species of wildlife, the land-capability rating can be stated. The final ratings are drafted onto 1/50,000-scale (1–¼ = 1 mile) topographical maps which will be available to land planning agencies.

The maps on ungulates are sent to Ottawa where they are fed into a computer and recorded on magnetic tape. The computer can reproduce the original maps to show areas of a particular capability or a comparison of land capabilities for different purposes. The ungulate maps will be published for the public in 1/250,000 scale.

Canada Land Inventory maps will enable planners to compare land capabilities and know which areas should be developed for wildlife production or recreational use. For example, the maps show that land which is Class 7 for agriculture is often Class 4 for ungulate production.

The true value of the inventory will be realized when the information collected by all sectors is available for land planning. It will then be possible, within the bounds of economics and sociology, to put land to its best use.

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Scale of Values for Rating the Terrestrial Physiographic Potential for the Production of Economic Cover (unpub.)

NEW GEAR FOR THE PATRICIA FISHERIES

by G. Lindsay Penney
Biologist, Sioux Lookout Forest District

The Patricia fisheries are reserved mainly for Indian commercial fishermen and sports fishing and, in some places, the commercial catch of fish has become a major source of revenue for the native peoples. Maintaining the harvest of fish at the maximum level per unit of effort or per dollar invested, then, becomes a major goal in the management of some of these fisheries which are not yet being touched by the sports fishing industry.

In 1966, production of commercial freshwater fish in the Sioux Lookout Forest District reached a peak of 3,000, 000 pounds (valued at $500,000.00) This output was much below the maximum, potential, sustained yield calculated for the Patricia fisheries. In order to manage this walleye–whitefish fishery anywhere near its optimum, improvement in the efficiency of the native fishermen are required. This involves both educating the fishermen on the best fishing techniques, handling procedures and storage requirements, and assuring that the most efficient gear is used.

Under a project supported by both the Provincial and Federal Governments through the Resources Development Agreement, Department of Lands and Forests fisheries technicians, biologists and conservation officers began small-scale pilot projects to evaluate the

Table 1 – Age of Maximum Growth in Five Northern Lakes as Compared to the Ages Harvested in 4" Mesh Gill Nets.

Lake	Species	Age of Maximum Growth	Average Age Harvested	Age Range of 2/3 of Harvest
Stout	Whitefish	7.2	6.1	5.6–7.5
	Walleye	5.2	8.6	7.8–9.8
Wunnummin	Whitefish	?	7.0	5.6–8.4
	Walleye	4.8	7.1	6.0–8.2
Favourable	Whitefish	3.0	9.2	?
	Walleye	4.0	7.5	8.4–8.7
Ponask	Whitefish	6.2	7.2	6.0–8.4
	Walleye	6.2	7.2	5.4–8.8
North Caribou	Whitefish	2.9	7.4	6.1–8.7
	Walleye	6.1	8.7	7.4–10.1

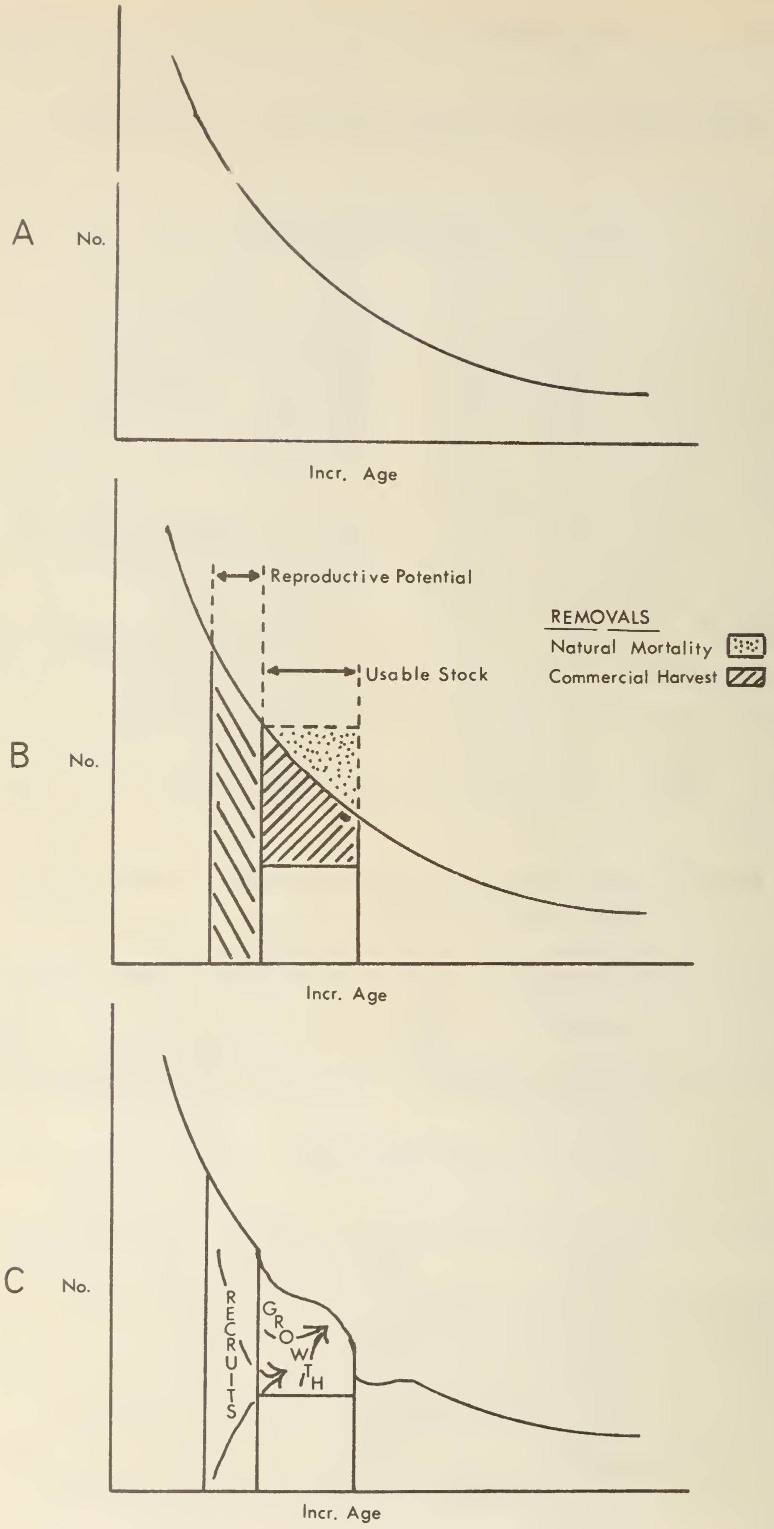
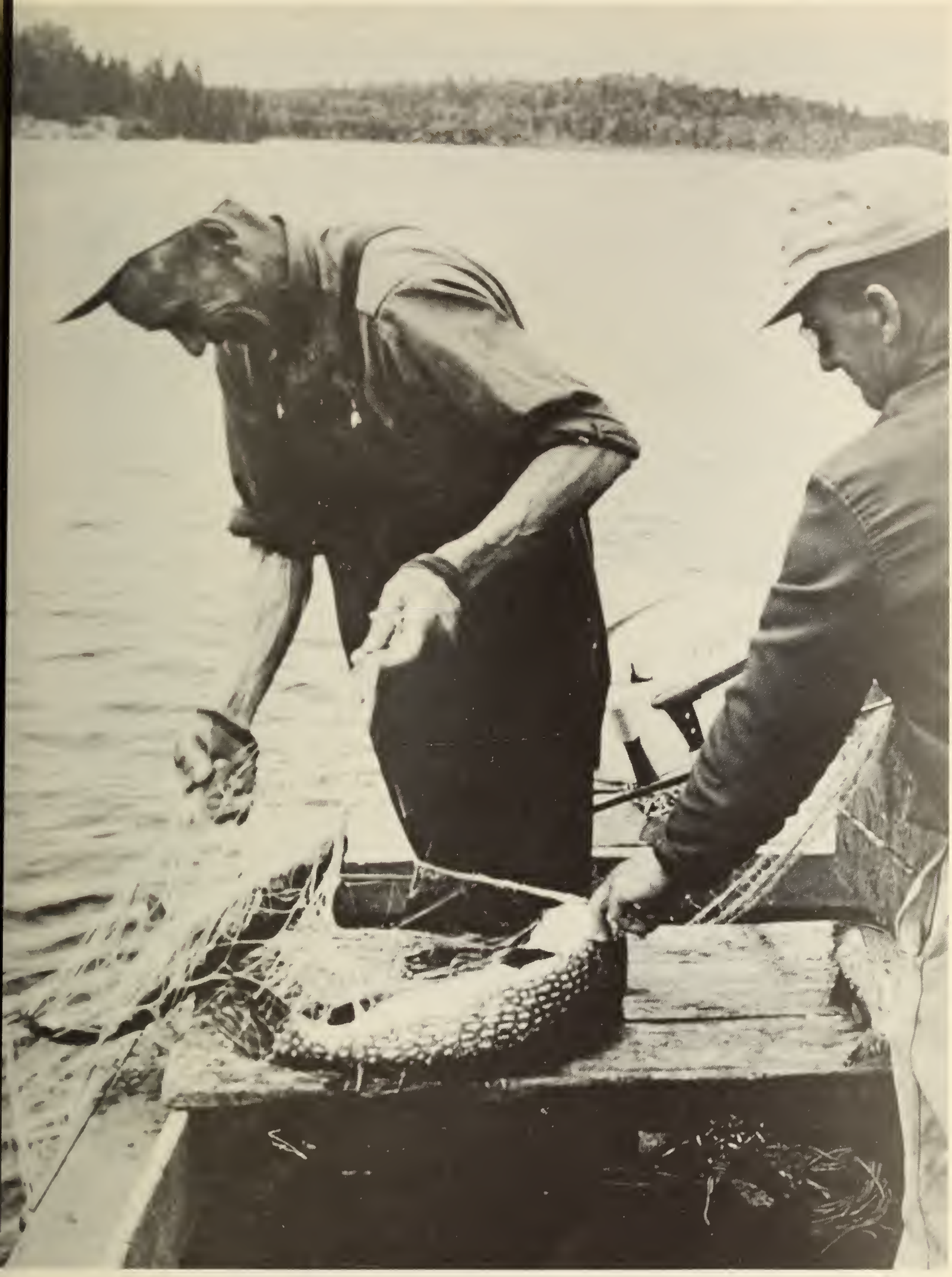


Figure 1. Hypothetical fish population (A), subjected to fishing pressure (B), and sustaining fishing pressure (C).



Fish being removed from a gill net. Photo by J.C.Weir.

the possibility and effects of increasing the commercial catch of walleye and whitefish by reductions in the mesh size of the gill net used by the fishermen.

Commercial fishing gear harvests a portion of the population called the "usable stock". In unfished waters, this usable stock, which is increased by natural recruitment, is reduced only by natural mortality. However, with the introduction of fishing gear, the usable stock is also depleted by the catch (Fig. 1). The catch drains the biomass (total mass of fish) within the usable stock, but this depletion can be offset by increased recruitment into the usable stock and increased growth rates of these recruits. The key to establishing sustained recruitment within environmental limits is to maintain an adequate, reproductive potential.

Preliminary investigations in 1963 and 1964 seemed to indicate that a reduction from 4–1/2" to 4" gill net mesh might increase the catch. In 1965 and 1966, experimental use of 4" nets by commercial fishermen was allowed by special licence on a few lakes so that the harvests could be analysed. During the summer of 1965, samples were taken from the commercial catches on nine of these lakes, and in 1966 on seven. The weight, length, age, sex and incidence of maturity for over 22,000 walleye and 13,000 whitefish were compiled.

Examination of the 1966 fish taken by 4" mesh indicated that the incidence of the youngest three age classes (5, 6 and 7 year–olds) within the usable stock had increased from 1965, i.e., recruitment had increased. Within one year, the growth rates of walleye and whitefish within the usable stock had also increased tangibly. It would seem that this increased recruitment and growth rate can be sustained since the incidence of immaturity in 32 samplings from 4" gear usually ranged from none to 7–1/2 per cent and never rose higher than 13 per cent.

The lower age limit of the harvest from commercial gear should be as near as feasible to the age at which growth rate levels off. At this point, the weight that the biomass is decreased by natural mortality is equalled by the weight which is contributed by increased growth. Once past the age of maximum growth, natural mortality can surpass the replenishment of growth at an ever increasing rate. If the age classes past the age of maximum growth can be harvested before they are reduced by natural mortality (as long as reproductive success is assured), the result is a maximum sustained yield. In Table I, the difference between the age at which maximum biomass occurs, and the bulk of the ages harvested from five of the experimental lakes, is small and, as noted before, a high percentage of the harvested fish are mature.

As well as yielding a maximum sustained harvest, the change to 4" mesh gill nets also produced tangible economic benefits to far–northern fishermen. Preliminary data indicate that 100 yards of 4" net set daily yields 1/2 pound more walleye than 100 yards of 4–1/2" gill net set daily. When this is considered on the basis of 2,000 or 4,000 yards set monthly, the commercial gill net fishermen may be able to receive from $87.00 to $174.00 more on their monthly walleye fishing, alone.

So often, the results of fisheries investigations do not lead to dramatic management changes. However, this investigation has led to a change which should have an effect not only on the fishery but also on the peoples dependent on the resource for part of their livelihood.

REFERENCES

Penney, G. L. 1966. Two Years Experimental Use of Four Inch Gill Nets in the Patricias (Unpublished District Report), Department of Lands and Forests, Sioux Lookout.

Crate full of predominantly whitefish. Commercial fishing is a major source of revenue for native people of the Patricias. Photo by K. Anderson.